

REMARKS

An interview was conducted between the Examiner and the undersigned on August 4, 2010, wherein the undersigned provisionally elected Group I, Claims 1-8, drawn to a method for removing deposit or a liquid from a substrate. In response to the restriction requirement in the Office Action mailed August 11, 2010, in connection with the above-identified application, Applicants affirm their provisional election of Group I, including Claims 1-8, drawn to a method for removing deposit or a liquid from a substrate.

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have amended Claim 1 to recite "[a] method for removing deposit from a substrate comprising: removing deposit that has attached to a main surface of a substrate from the main surface of the substrate using a number of air knife assemblies in which a slit portion is formed at the rear of the bottom surface so that a fluid can be discharged in band form when each air knife assembly is positioned so that the bottom surface thereof faces the main surface of a substrate and is moved relative to the substrate while a fluid is discharged from the slit portion; forming a fluid introduction path having such a clearance as to make it possible for the fluid discharged from the slit portion to pass through in a condensed state between the main surface of the substrate and the bottom surface of each of the air knife assemblies so as to have an approximately uniform form in the direction perpendicular to the direction in which the air knife assemblies move; discharging a fluid from the slit portion so that the fluid passes through the fluid introduction path in a condensed state, and then the condensed fluid that passes through the fluid introduction path is led to a wall surface that is formed so as to face the front portion of the air knife assemblies or is

led to collide with the fluid from the adjacent air knife assembly that operates as a wall surface, and; leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife so that the cross section of the flow path is greater than that of the fluid introduction path, and allows the condensed fluid discharged from the fluid introduction path to disperse.” For example, support for the current amendment to Claim 1 may be found in the Specification at paragraphs [0011], [0012]-[0016], [0025], [0048], [0050], [0052], [0056], and Fig. 3.

Applicants have amended Claim 3 to recite “a fluid that is discharged from the slit portion of one air knife unit operates as a wall surface and a fluid that is discharged from the slit portion of the other air knife is made to collide with said wall surface.” For example, support for the current amendment to Claim 3 may be found in the Specification at paragraphs [0016] and [0056].

Applicants have canceled Claim 6 without prejudice or disclaimer.

Applicants have amended Claim 7 to recite “the fluid that is discharged from the slit portions is a combination of a gas for drying a substrate and a liquid for cleaning a substrate.” For example, support for the current amendment to Claim 7 may be found in the Specification at paragraph [0019].

Applicants have cancelled Claims 9-20 without prejudice or disclaimer.

Applicants have added new Claim 21, which recites “[a] method for removing deposit from a substrate comprising: removing deposit that has attached to a main surface of a substrate from the main surface of the substrate using air knife units in which a slit portion is formed so that a fluid can be discharged in band form; forming a fluid introduction path having an approximately uniform form in the direction

perpendicular to the direction in which a number of air knife units move relative to a substrate, so that the fluid introduction path is between the air knife units and the main surface of the substrate while the air knife units move relative to the substrate; discharging a fluid toward the fluid introduction path from a slit portion that is formed in the rear portion of said air knife units, and then, passes through the fluid introduction path so as to be led to a wall surface that is formed so as to face the front portion of the air knife units or said fluid, which operates as a wall surface; and leading away deposit that has deposited on the substrate from the main surface of the substrate, together with said fluid, via a fluid lead-out path which is formed between the air knife units and the wall surface so that the cross section of the flow path is greater than that of the fluid introduction path; wherein the clearance between the air knife units and the main surface of the substrate is adjusted using the Venturi effect between the air knife units and the main surface of the substrate when the fluid passes through the fluid lead-out path, and thereby, the air knife units are supported relative to the main surface of the substrate in such a manner as to fluctuate.” Applicants respectfully submit that that new Claim 21 corresponds to and includes the subject matter recited in original Claim 2 and original Claim 1, with reformatting of the recitations of Claim 1 so that the preamble is readily apparent and separate from the body of the claim, and so that the process steps intended as limitations of the Claim are clearly and positively presented, as suggested in the Examiner’s objection to Claim 1 on pages 4 and 5 of the Office Action mailed August 11, 2010. In addition, Claim 21 differs from Claim 1 in that Claim 21 includes a recitation of “said fluid, which operates as a wall surface.” For example, support may be found in the Specification for the recitation: “said fluid, which operates as a wall surface,” at paragraphs [0016] and [0056].

Applicants have added new Claim 22, which recites "[t]he method for removing deposit from a substrate according to Claim 21, wherein the air knife units are paired in the configuration, and in each pair, a fluid that is discharged from the slit portion of one air knife unit operates as a wall surface and a fluid that is discharged from the slit portion of the other air knife is made to collide with said wall surface, and furthermore, said fluid is led away from the main surface of the substrate via said fluid lead-out path." Applicants respectfully submit that the subject matter recited in new Claim 22 corresponds to amended Claim 3, which depends on Claim 1.

Applicants have added new Claim 23, which recites "[t]he method for removing deposit from a substrate according to Claim 21, wherein the air knife units are aligned parallel to each other, the rear portion of one air knife unit in each adjacent pair of air knife units is used as a wall surface, and a fluid that is discharged from the slit portion of the other air knife unit is led to said wall surface, and furthermore, said fluid is led away from the main surface of the substrate via said fluid lead-out path." Applicants respectfully submit that the subject matter recited in new Claim 23 corresponds to original Claim 4, which depends on Claim 1.

Applicants have added new Claim 24, which recites "[t]he method for removing deposit from a substrate according to Claim 21, wherein at least two air knife units of a pair are respectively provided on the two main surfaces, front and rear, of the substrate." Applicants respectfully submit that the subject matter recited in new Claim 24 corresponds to original Claim 5, which depends on Claim 1.

Applicants have added new Claim 25, which recites "[t]he method for removing deposit from a substrate according to Claim 21, wherein the fluid that is discharged from the slit portions is a combination of a gas for drying a substrate and

a liquid for cleaning a substrate.” Applicants respectfully submit that the subject matter recited in new Claim 25 corresponds to amended Claim 7, which depends on Claim 1.

Applicants have amended Fig. 10 by inserting two reference characters “203” illustrating the “discharge duct.” Applicants have amended Fig. 13 and Fig. 14 by inserting the caption “Background.” In view of the current amendments to Fig. 10, Fig. 13, and Fig. 14, Applicants respectfully submit that the objection to the drawings as set forth on pages 3 and 4 of the Office Action mailed August 11, 2010, is moot. Applicants respectfully submit that the current amendment to Fig. 10, Fig. 13, and Fig. 14 does not add new matter.

Applicants have amended paragraphs [0022] through [0035] of the Specification by removing reference to specific claim numbers. In view of the current amendments to the Specification, Applicants respectfully submit that the objection to the Specification, as set forth on page 4 of the Office Action mailed August 11, 2010, is moot. Applicants respectfully submit that the current amendment to the Specification does not add new matter.

In view of the current amendments to Claim 1, as set forth above, Applicants respectfully submit that the objection to Claim 1, the Examiner suggesting that the claim should be written such that the preamble is readily apparent and separate from the body of the claim, and such that the process steps intended as limitations of the Claim are clearly and positively presented, as set forth on pages 4 and 5 of the Office Action mailed August 11, 2010, is moot.

The rejection of Claim 3 under the provisions of 35 U.S.C. §112, second paragraph, the Examiner contending Claim 3 as being indefinite, and the Examiner contending it is not clear how the fluid would appear as a wall, as set forth on page 5

of the Office Action mailed August 11, 2010, is noted. In view of the current amendment to Claim 3, which currently recites "a fluid that is discharged from the slit portion of one air knife unit operates as a wall surface and a fluid that is discharged from the slit portion of the other air knife is made to collide with said wall surface," Applicants respectfully submit that that the rejection of Claim 3 under the provisions of 35 U.S.C. §112, second paragraph, is moot.

The rejection of Claim 7 under the provisions of 35 U.S.C. §112, second paragraph, the Examiner contending Claim 7 as being indefinite, and the Examiner contending it is unclear whether the limitation "the fluid that is discharged from the slit portions is a gas for drying a substrate and a liquid for cleaning a substrate," intended to mean that (a) the fluid discharged from each of the air knives is a combination of both a gas and a liquid; or (b) the fluid being discharged from one air knife is a gas, while the fluid discharged from the other air knife is a liquid, as set forth on pages 5 and 6 of the Office Action mailed August 11, 2010, is noted. In view of the current amendment to Claim 7, which currently recites "the fluid that is discharged from the slit portions is a combination of a gas for drying a substrate and a liquid for cleaning a substrate," Applicants respectfully submit that that the rejection of Claim 7 under the provisions of 35 U.S.C. §112, second paragraph, is moot.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action mailed August 11, 2010, that is, the teachings of the Japan Patent Application Pub. No. JP 09-162147 to Shima (hereinafter Shima), U.S. Patent No. 4,197,126 to Wessells et al. (hereinafter Wessells), Japan Patent Application Pub. No. 2000-146443 to Yamazaki et al. (hereinafter Yamazaki), and U.S. Patent Application Pub. No.

2002/0148483 to Mertens et al. (hereinafter Mertens) under the provisions of 35 U.S.C. §103(a). Applicants respectfully submit that the rejection of Claim 6 under the provisions of 35 U.S.C. §103(a) as unpatentable over Shima in view of Wessells and U.S. Patent No. 4,477,287 to Kush et al. (hereinafter Kush), is moot in light of the current cancellation of Claim 6.

The present invention is directed to a method for removing deposit and drying a substrate by removing liquid.

As described on page 1 of Applicants' specification, the present inventors, in studying cleaning and drying of substrates such as glass, liquid crystal displays, and semiconductor wafers, have found that an air knife may be used. The air knife is usually formed in such a manner that steam or a gas is jetted in band form from a slit.

In a first known apparatus for processing a substrate, a wet substrate, such as glass, a liquid crystal display, or a semiconductor wafer is mounted on a roller conveyor that conveys the substrate toward a pair of air knives, which are intended to remove the liquid from the front and rear surfaces of the substrate, so as to dry the substrate. Specification, paragraph [0003]. The air knives of the pair are provided above and below the substrate on the path of conveyance of the substrate. Specification, paragraph [0003]. The air knives are inclined by approximately 30° relative to the direction perpendicular to the direction in which the substrate is conveyed by the roller conveyor. Specification, paragraph [0004]. The air knives have a slit opening for gas discharge, which covers the area between the two ends of the substrate in the direction perpendicular to the direction in which substrate is conveyed. Specification, paragraph [0004]. The air knives blow air in band form on

the substrate, which passes directly beneath or directly above the air knives, at an appropriate distance from the substrate. Specification, paragraph [0004].

In a first known method and apparatus for drying the substrate using the air knives, the liquid on the front and rear surface of the substrate is swept to the downstream side, in the direction in which the substrate is conveyed, and after that, the liquid swept from one corner to another along the surface of the substrate. Specification, paragraph [0008]. At this point, the liquid attaches to an end of the surface of the substrate, where the liquid cannot easily be removed, and therefore, it is difficult to sufficiently dry the substrate. Specification, paragraph [0008].

In a second known method and apparatus for drying a substrate, an upper air knife is placed over the upper surface of the substrate and is provided with a gas jetting portion for jetting compressed air. Specification, paragraph [0005]. A mist collecting portion is also provided over the upper surface. Specification, paragraph [0005]. A lower air knife is placed over the lower surface of substrate and is provided with a gas jetting portion and a mist collecting portion in the same manner as upper air knife. Specification, paragraph [0005]. Often, liquid adheres to the upper surface of the substrate as a liquid film, and liquid adheres to the lower surface of substrate as liquid drops. Specification, paragraph [0006]. When the substrate is conveyed past the air knives, the gas jetting portions and of the respective air knives blow a gas, such as compressed air, on the front and rear surface of the substrate. Specification, paragraph [0006]. The gas is blown diagonally downward and diagonally upward from jetting openings of the air knives oriented above and below the substrate, respectively. Specification, paragraph [0006]. All of the liquid film on the upper surface of the substrate is blown to the opposite side of the substrate to the direction in which the substrate is conveyed,

and at the same time, mist is created above the substrate, which is sucked by the mist collecting portion. Specification, paragraph [0006]. The liquid drops on the lower surface of the substrate are converted to mist, as on the upper surface of the substrate, and are sucked by a mist collecting portion. Specification, paragraph [0006].

In the second known method and apparatus for drying the substrate, the substrate passes by air knives, and some of the mist which rises from the surface of substrate flies over to the upstream side of the air knives in the direction in which the substrate is conveyed. Specification, paragraph [0009]. This mist again adheres to the front and rear surface of dried substrate. Specification, paragraph [0009]. Moreover, the liquid that has attached to the front and rear surface of substrate is not entirely collected by mist collecting portions, even when converted to mist, and the liquid gathers on the rear side of the substrate as the air knives move. Specification, paragraph [0009]. The liquid adheres to the end surface on the rear of substrate, in the same manner as the first known apparatus for processing a substrate, as described above, and again, it is difficult to sufficiently dry the substrate. Specification, paragraph [0009].

Against this background, Applicants provide a method for removing deposit and drying a substrate by removing liquid, which overcomes problems in connection with prior procedures, whereby the foregoing problems can be avoided. Specifically, Applicants have found that by utilizing method for removing deposit from a substrate comprising: removing deposit that has attached to a main surface of a substrate from the main surface of the substrate using a number of air knife assemblies in which a slit portion is formed at the rear of the bottom surface so that a fluid can be discharged in band form when each air knife assembly is positioned so that the

bottom surface thereof faces the main surface of a substrate and is moved relative to the substrate while a fluid is discharged from the slit portion; forming a fluid introduction path having such a clearance as to make it possible for the fluid discharged from the slit portion to pass through in a condensed state between the main surface of the substrate and the bottom surface of each of the air knife assemblies so as to have an approximately uniform form in the direction perpendicular to the direction in which the air knife assemblies move; discharging a fluid from the slit portion so that the fluid passes through the fluid introduction path in a condensed state, and then the condensed fluid that passes through the fluid introduction path is led to a wall surface that is formed so as to face the front portion of the air knife assemblies or is led to collide with the fluid from the adjacent air knife assembly that operates as a wall surface, and; leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife so that the cross section of the flow path is greater than that of the fluid introduction path, and allows the condensed fluid discharged from the fluid introduction path to disperse, the above noted problems may be avoided. Since the liquid is converted to mist and the direction of the mist is changed 90°, and the mist is carried away from the substrate, the mist can be prevented from reattaching to the front and rear surface of the substrate as liquid. Specification, paragraphs [0022], [0056], and [0058]. Moreover, the liquid does not aggregate on the front and rear surfaces of the substrate, as noted above with respect to prior air knife apparatus and methods, and the size of the liquid mist is reduced and carried away from the substrate. Specification, paragraphs [0022] and [0058]. Moreover, the liquid may be removed from the front

and rear of the two main surfaces of the substrate simultaneously. Specification, paragraph [0026] and [0057].

In response to the rejection of Claims 1 and 8 under the provisions of 35 U.S.C. §103(a) as being unpatentable over Shima in view of Wessells, as set forth on pages 7 and 8 of the Office Action mailed August 11, 2010, Applicants respectfully submit that that the combined disclosures of Shima and Wessells would not have disclosed or rendered obvious the recitations of Claims 1 and 8, for the reasons noted below.

Shima would have disclosed a substrate processing device that supplies processing fluid to a horizontally conveyed substrate. Shima paragraph [0001]. Shima would have disclosed that a boundary region is created between two processing fluids that are deposited on the substrate, and the boundary region prevents the two processing fluids from mixing. Shima, paragraphs [0012] and [0041]. The boundary region is established on the surface of the substrate by a pair of facing gas exit cones that are formed by a pair of air knives disposed over the surface of the substrate. Shima, paragraphs [0026]-[0028] and [0039]-[0044].

Shima would have disclosed that as the substrate is conveyed under the air knives, different processing fluids are deposited by separate sprinkling tubes on an upstream side and a downstream side of the boundary region formed on the substrate. Shima, paragraphs [0039]-[0041]. Shima would have disclosed that, as the substrate is conveyed, a first processing fluid is deposited as a layer on the upstream side of the boundary region on the substrate, and that the first processing fluid layer is pushed upstream on the surface of the substrate, by the air knives disposed over the substrate, toward the upstream edge of the substrate. Shima, paragraphs [0020]-[0022], [0038]-[0040], and Fig. 4. Shima would have disclosed

that, as the substrate is conveyed, a second processing fluid is deposited as a layer on the downstream side of the boundary region on the substrate, and that the second processing fluid layer is pushed downstream on the surface of the substrate, by the air knives disposed over the substrate, toward the downstream edge of the substrate. Shima, paragraphs [0020]-[0022], [0036]-[0038], and Fig. 4. Therefore, Shima would have disclosed processing the surface of a substrate with separate and different processing fluids by forming a boundary region on the surface substrate with gas from air knives; and Shima would have disclosed a method pushing the separate fluids downstream and upstream toward the opposite edges of the substrate, for the purpose of avoiding the adverse effects caused by mixing of both of the processing fluids on the surface of the substrate. Shima, paragraphs [0020]-[0022], [0026]-[0028], [0039]-[0044], [0054], and Figs. 3 and 4.

Wessells, would have disclosed a method for development of a printing plate using a carefully controlled gas stream after selectively exposing the plate to actinic radiation and a liquid photopolymer composition. Wessells, col. 1, lines 55-58. Wessells would have disclosed a platen for holding the plate to be processed. Wessells, col. 3, lines 57-68. Wessells would have also disclosed that the platen may be stationary and an air knife moves over it, that the air knife is stationary and the platen moves under it, or that both the platen and the air knife move with respect to one another. Wessells, col. 13, lines 47-53.

Applicants respectfully submit that Shima would have taught away from the recitations of Claim 1, because, as noted above, Shima would have disclosed that a boundary region that is formed on the surface of a substrate by air knives serves to prevent two different processing fluids from mixing, and Shima would have disclosed that the air knives push the different processing fluids toward opposite edges of the

substrate, while Claim 1 recites, inter alia, "leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife." Applicants respectfully submit that the teachings of Shima, including sweeping separate fluids across the substrate to opposite edges of the substrate, involves a different process that serves a different purpose than "leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife," as recited in Claim 1, because Shima would have caused the above-noted problem of fluid aggregating on the end surfaces of the substrate. Applicants respectfully submit that Shima would have disclosed a process that forces liquids to aggregate on end surfaces of the substrate. Applicants respectfully submit that once liquid has aggregated on the end surface of the substrate, it is very difficult to completely dry the substrate, as noted above. Claim 1 recites a method that solves this problem by, inter alia, "leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife," because the method recited in Claim 1 carries away the fluid and deposit so that they do not aggregate or reattach to the substrate, as noted above.

In addition, Applicants respectfully submit that the combined teachings of Shima and Wessells would not have disclosed or rendered obvious a method of removing deposit from a substrate, as recited in Claim 1, because, as noted above, Shima would have disclosed air knives that push different processing fluids toward

opposite edges of the substrate, while Claim 1 recites, inter alia, "leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife," which is a different method than that disclosed by Shima. Moreover, Wessells would not have remedied the deficiencies of Shima, because Wessells would not have disclosed or rendered obvious a method including, inter alia, "leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife," as recited in Claim 1.

Therefore, Applicants respectfully submit that that Claim 1 is patentable, because Shima would have taught away from the recitations of Claim 1, and the combined disclosure of Shima and Wessells would not have disclosed or rendered obvious the recitations of Claim 1.

Applicants respectfully submit that Shima would have taught away from the recitations of Claim 8, because, as noted above, Shima would have disclosed that a boundary region that is formed on the surface of a substrate by air knives serves to prevent two different processing fluids from mixing, and Shima would have disclosed that the air knives push the different processing fluids toward opposite edges of the substrate, while Claim 8 recites, inter alia, "a liquid that has attached to the substrate is led away from the main surface of the substrate, together with said dry gas, via a fluid lead-out path of which the cross sectional area of the flow path is greater than that of the fluid introduction path and which is formed between the air knife units and the wall surface." Applicants respectfully submit that the teachings of Shima,

including sweeping separate fluids across the substrate to opposite edges of the substrate, involves a different process that serves a different purpose than a method where "a liquid that has attached to the substrate is led away from the main surface of the substrate, together with said dry gas, via a fluid lead-out path of which the cross sectional area of the flow path is greater than that of the fluid introduction path and which is formed between the air knife units and the wall surface," as recited in Claim 8, because Shima would have caused the above-noted problem of fluid aggregating on the end surfaces of the substrate. Applicants respectfully submit that Shima would have disclosed a process that forces liquids to aggregate on end surfaces of the substrate. Applicants respectfully submit that once liquid has aggregated on the end surface of the substrate, it is very difficult to completely dry the substrate, as noted above. Claim 8 recites a method that solves this problem involving steps where, inter alia, "a liquid that has attached to the substrate is led away from the main surface of the substrate, together with said dry gas, via a fluid lead-out path of which the cross sectional area of the flow path is greater than that of the fluid introduction path and which is formed between the air knife units and the wall surface," because the method recited in Claim 8 carries away the liquid and dry gas so that the liquid does not aggregate or reattach to the substrate, as noted above.

In addition, Applicants respectfully submit that the combined teachings of Shima and Wessells would not have disclosed or rendered obvious a method for drying a substrate, as recited in Claim 8, because, as noted above, Shima would have disclosed air knives that push different processing fluids toward opposite edges of the substrate, while Claim 8 recites a method where, inter alia, "a liquid that has attached to the substrate is led away from the main surface of the substrate, together

with said dry gas, via a fluid lead-out path of which the cross sectional area of the flow path is greater than that of the fluid introduction path and which is formed between the air knife units and the wall surface," which is a different method than that disclosed by Shima. Moreover, Wessells would not have remedied the deficiencies of Shima, because Wessells would not have disclosed or rendered obvious a method where "a liquid that has attached to the substrate is led away from the main surface of the substrate, together with said dry gas, via a fluid lead-out path of which the cross sectional area of the flow path is greater than that of the fluid introduction path and which is formed between the air knife units and the wall surface," as recited in Claim 8.

Therefore, Applicants respectfully submit that that Claim 8 is patentable, because Shima would have taught away from the recitations of Claim 8, and the combined disclosures of Shima and Wessells would not have disclosed or rendered obvious the recitations of Claim 8.

In response to the rejection of Claims 3 and 4 under the provisions of 35 U.S.C. §103(a) as being unpatentable over Shima in view of Wessells, as set forth on page 8 of the Office Action mailed August 11, 2010, Applicants respectfully submit that that the combined disclosures of Shima and Wessells would not have disclosed or rendered obvious the recitations of Claims 3 and 4, because Claims 3 and 4 depend on Claim 1. Claim 1 is patentable over Shima in view of Wessells, as noted above. A dependent Claim refers back to, and incorporates the recitations of, a claim on which it depends; and the recitations of a dependent claim must be read as a whole with the recitations of a claim on which it depends. Therefore, for the reasons stated above, Applicants respectfully submit that Claims 3 and 4 are

patentable over Shima in view of Wessells and the additional recitations of Claims 3 and 4 are patentable over Shima in view of Wessells.

In response to the rejection of Claim 5 under the provisions of 35 U.S.C. §103(a) as being unpatentable over Shima in view of Wessells and Yamazaki, as set forth on pages 8 and 9 of the Office Action mailed August 11, 2010, Applicants respectfully submit that the combined disclosures of Shima, Wessells, and Yamazaki would not have disclosed or rendered obvious the recitations of Claim 5 for the reasons noted below.

Applicants respectfully submit that the disclosures of Shima and Wessells are discussed above. Yamazaki would have disclosed an air knife disposed both above and below the substrate. Yamazaki, paragraphs [022] and [0041]; and Fig. 3. Moreover, Yamazaki would have disclosed that a fluid that is adhered to the substrate surface is pushed, by an air knife, toward the end surface of the substrate in a direction opposite of conveyance of the substrate. Yamazaki, paragraphs [0015] [0040], [0041], and Fig. 3.

For the reasons noted above, Applicants again respectfully submit that the combined teachings of Shima and Wessells would not have disclosed or rendered obvious a method of removing deposit from a substrate, as recited in Claim 1, on which Claim 5 depends. As noted above, Yamazaki would have disclosed that fluid that is adhered to the surface of the substrate is pushed by an air knife toward the end surface of the substrate in a direction opposite of conveyance of the substrate. Applicants respectfully submit that Yamazaki would have caused the problem related to aggregation of the fluid at the end surface of the substrate, and the drying problems associated with such aggregation, as discussed above. In addition, Yamazaki would not remedied the deficiencies of Shima and Wessells, because

Yamazaki would not have disclosed or rendered obvious a method of removing deposit from a substrate, including, inter alia, "leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife," as recited in Claim 1. Therefore, Applicants respectfully submit that Claim 1 would not have been obvious over Shima in view of Wessells and Yamazaki, and that Claim 1 is patentable over Shima in view of Wessells and Yamazaki.

Moreover, Applicants respectfully submit that Claim 5 depends on Claim 1, which is patentable over Shima in view of Wessells and Yamazaki, as noted above. Applicants respectfully submit that a dependent claim refers back to, and incorporates the recitations of, the claim on which it depends; and the recitations of a dependent claim must be read as a whole with the recitations of a claim on which it depends. Therefore, for the reasons stated above, Applicants respectfully submit that Claim 5 is patentable over Shima in view of Wessells and Yamazaki, and the additional recitations of Claim 5 are patentable over Shima in view of Wessells and Yamazaki.

In response to the rejection of Claim 6 under the provisions of 35 U.S.C. §103(a) as being unpatentable over Shima in view of Wessells and Kush, as set forth on page 9 of the Office Action mailed August 11, 2010, Applicants respectfully submit that that the rejection is moot in light of the current cancellation of Claim 6.

In response to the rejection of Claim 7 under the provisions of 35 U.S.C. §103(a) as being unpatentable over Shima in view of Wessells and Mertens, as set forth on pages 9 and 10 of the Office Action mailed August 11, 2010, Applicants respectfully submit that that the combined disclosures of Shima, Wessells, and

Mertens would not have disclosed or rendered obvious the recitations of Claim 7 for the reasons noted below.

Applicants respectfully submit that the disclosures of Shima and Wessells are discussed above. Mertens would have disclosed a method and apparatus for removing a liquid from a surface of a substrate by creating a liquid-ambient boundary and rotating the substrate to remove the liquid. Mertens, abstract. Mertens would have further disclosed a liquid sprayed on at least a part of the substrate. Mertens, paragraph, [0012]. Mertens would have also disclosed that the liquid is locally heated by a heat source, such as a nozzle dispensing heated gas or a vapor. Mertens, paragraph, [0012].

For the reasons noted above, Applicants respectfully submit that the combined teachings of Shima and Wessells would not have disclosed or rendered obvious a method of removing deposit from a substrate, as recited in Claim 1, on which Claim 7 depends. As noted above, Mertens would have disclosed a liquid sprayed on at least a part of the substrate, and that the liquid is locally heated by a heat source, such as a nozzle dispensing heated gas or a vapor. Applicants respectfully submit that Mertens would not remedied the deficiencies of Shima and Wessells, because Mertens would not have disclosed or rendered obvious a method of removing deposit from a substrate, including, inter alia, "leading the deposit that has deposited on the substrate away from the main surface of the substrate, together with the fluid, via a fluid lead-out path which is formed between each air knife assembly and the wall surface or fluid from the adjacent air knife," as recited in Claim 1. Therefore, Applicants respectfully submit that Claim 1 would not have been obvious over Shima in view of Wessells and Mertens, and that Claim 1 is patentable over Shima in view of Wessells and Mertens.

Moreover, Applicants respectfully submit that Claim 7 depends on Claim 1, which is patentable over Shima in view of Wessells and Mertens, as noted above. Applicants respectfully submit that a dependent claim refers back to, and incorporates the recitations of, the claim on which it depends; and the recitations of a dependent claim must be read as a whole with the recitations of a claim on which it depends. Therefore, for the reasons stated above, Applicants respectfully submit that Claim 7 is patentable over Shima in view of Wessells and Mertens, and the additional recitations of Claim 7 are patentable over Shima in view of Wessells and Mertens.

Applicants thank the Examiner for her indication that Claim 2 would be allowable if rewritten independent form including all of the recitations of Claim 1, as set forth on pages 10 and 11 of the Office Action mailed August 11, 2010. Applicants have added new Claim 21, which includes all of the recitations of Claim 2, and the recitations of Claim 1, which are amended so that the original recitation of "has an appearance of a wall surface," of Claim 1, is currently amended to "operates as a wall surface"; and such that the preamble of Claim 1 is readily apparent and separate from the body of the claim, and such that the process steps intended as limitations of Claim 1 are clearly and positively presented. Applicants respectfully submit that Claim 21 is patentable in light of the Examiner's assertion that Claim 2 would be allowable if amended into independent form to contain all of the recitations of Claim 1, and fact that Claim 21 contains all of the recitations of Claims 1 and 2.

Claim 22 corresponds to Claim 3, as currently presented. Claim 23 corresponds to original Claim 4. Claim 24 corresponds to original Claim 5. Claim 25 corresponds to Claim 7, as currently presented.

Claims 22-25 depend on Claim 21. A dependent claim refers back to, and incorporates the recitations of, a claim on which it depends; and the additional recitations of a dependent claim must be read as a whole with the recitations of a claim on which it depends. For the above-noted reasons, Applicants respectfully submit that Claims 21-25 are patentable.

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently in the application are respectfully requested.

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Docket No. 1343.46195X00).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

By /Alan E. Schiavelli/
Alan E. Schiavelli
Registration No. 32,087

AES/GNT/kr
1300 N. Seventeenth Street
Suite 1800
Arlington, Virginia 22209
Tel: 703-312-6600
Fax: 703-312-6666